Gravity… Can we stop the flow of water?

Standards Statements:
3.2.10.A – Apply knowledge and understanding about the nature of scientific and technological knowledge.
3.4.10.C – Distinguish among the principles of force and motion.
National Standard:
- Knows that all energy is considered to be either kinetic energy, potential energy, or energy contained by a field.
- Understands general concepts related to gravitational force.
Content Objectives:
Students will be able to:
1. Explain how gravity affects processes on Earth.
2. Compare and contrast Earth's gravity with microgravity.
3. Explain how a freefall experience simulates a microgravity environment.
Process Objectives:
Students will be able to:
1. Neatly record and organize observations.
2. Communicate with others concerning a microgravity environment.
Assessment Strategies:
1. Neatly organizing and recording of observations collected during can toss.
2. Creation of a graphic organizer to compare and contrast microgravity to gravity.
Procedures:
1. Introduce Microgravity and allow students to read *Microgravity*.
2. Discuss their understanding of microgravity in comparison to the gravity of Earth.
3. Introduce the challenge: Can we stop the flow of water from this aluminum can?
4. Allow students to brainstorm ways that this might be accomplished.

Suggested Level:
Intermediate/Secondary

Standard Categories:
3.2 – Inquiry and Design
3.4 – Physical Science, Chemistry, and Physics

Materials:
Empty Aluminum Cans
Thumb Tack
Catch Basin
Water
Paper Towels

Instructional Strategies:
Cooperative Learning
Inquiry
Discussion

Related Concepts:
Organization
Communication Skills
Objective Observation
Estimation

How can we stop the flow of water?

An inquiry activity will be used to investigate the behavior of materials in a microgravity environment.

Thought questions to begin:
Will water continue to flow from aluminum can when subject to a simulated microgravity environment?
How can we simulate microgravity while on Earth?

Investigation:
To investigate the impact of microgravity on water flowing from a can, follow the following instructions carefully:
1. Obtain an empty aluminum can and a thumb tack.
2. Puncture a small hole on the side of the aluminum can approximately 1 cm from the base.
3. Obtain a catch basin.
4. Cover the hole in the side of the can and fill the can with water.
5. Stand approximately 2 meters from the catch basin. Toss the can in the upright position into the catch basin. *Hint: You may want a partner to hold the catch basin and maneuver it to ensure a safe landing.
6. Observe the flow of the water as the can flies through the air.
7. Repeat steps 1 through 6 five times. 8. Record observations.

Questions to ponder:
1. What is a force? What forces are considered *Universal Forces?* Why are these called Universal Forces?
2. What force is acting upon the water in the can as it is held above ground?
3. What is Potential Energy? What factors influence the amount of potential energy that an object has?
3. What is Kinetic Energy? What factors influence the amount of kinetic energy that an object has?
4. What type of energy do the can and the water have at this location: potential energy, kinetic energy, or both? Explain your answer.
5. When the can is thrown towards the catch basin, what energy conversion is occurring? Explain your answer for both the can and the water!
6. What does the Law of Conservation of Energy State? Where are you observing this law in this inquiry investigation?
7. What is projectile motion? What forces must combine to produce this type of path?
8. Explain why the flow of water stops as the can falls through the air?
9. What are the similarities and differences between Earth's gravity and the gravity in space? What is the gravity of space referred to as? Why is this term appropriate?
10. Would dropping the can in a direct vertical path produce the same results? Try it and find out!

Graphic Organizer

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	**Self**	**Teacher**	**Other(s)**
1. An appropriate type of graphic organizer was used to represent the science concepts or processes.				
2. Conceptual information that is displayed within the organizer is scientifically accurate.				
3. Appropriately sized geometric shapes are used throughout to clearly represent science concepts or processes.				
4. Relationships among the geometric shapes are clearly shown with connecting lines.				
5. The eye of the observer is immediately drawn to the topic and main supporting concepts.				
6. There is a natural flow and order to the graphic organizer that allows for easy interpretation by others.				
7. A variety of graphic features such as different textures, shapes, and colors are used to highlight information and enhance the organizer's effectiveness.				
8. Relationships shown among the concepts are accurate and relevant to the topic.				
9. The organizer is neatly drawn, legible, and attractive.				

O Comments O Goals O Actions